The 1988 Calgary Winter Olympics

CANMORE NORDIC CENTRE

MASTER DEVELOPMENT PLAN

EXECUTIVE SUMMARY

Alberta Olympic Secretariat

October 1984

Canmore Nordic Centre

Master Development Plan

ALBERTA
OLYMPIC SECRETARIAT

CARSON-McCULLOCH
ASSOCIATES LTD.

Summary Report

October 11th 1984

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PART I INTRODUCTION

1. Background:

In September of 1981, the Alberta Government made a commitment to support the hosting of the XV Olympic Winter Games in Calgary. One element of this support was a commitment to develop the facilities necessary to host the Olympic cross country and biathlon events.

On September 30, 1983, the XV Olympic Winter Games Organizing Committee (OCO'88) announced that the "Georgetown Site" had been selected as the venue for hosting the cross country and biathlon events in 1988. The site was subsequently, formally named Canmore Nordic Centre.

The Alberta Government supported OCO'88's site selection and immediately proceeded with the preliminary planning necessary to fulfill its development responsibilities.

In conjunction with OCO'88, the technical requirements and standards associated with providing Olympic calibre cross country and biathlon facilities were identified and formed the basis of terms of reference for a master plan for the site. In addition to Olympic requirements, the need to accommodate longer term recreational, training and competition users was also addressed.

A consultant proposal call for the preparation of a master plan was issued in November 1983 and, following extensive evaluations, a consultant team was selected to initiate the plan in January, 1984.

2. Olympic Sports:

Two Olympic sports will be hosted at the Canmore Nordic Centre in 1988. Cross country is a well known sport and will comprise the majority of nordic skiing events in the Olympics. Biathlon is a lesser known, but growing sport in North America. It represents a combination of cross country skiing and marksmanship (i.e. shooting with small bore rifles).

The skiing component of the Nordic Combined event will also occur at the Canmore Nordic Centre. This event combines ski jumping, which will take place at Canada Olympic Park, and cross country skiing.

3. The Site:

The Canmore Nordic Centre site is located approximately 100 kilometres west of Calgary, adjacent to the Town of Canmore (refer to Figure 1). Access to the site is via the Trans-Canada Highway, through the Town of Canmore and approximately 1.8 kilometres from the Town boundary via the Smith-Dorrien/Spray Trail (S.R. 742).

The proposed development area is provincial crown land, within Kananaskis Country, and is approximately six kilometres in length and three kilometres in width. The site can be geographically described as being located on a terrace which is bounded on the south by Mt. Rundle, on the east by S.R. 742, on the north by the Bow River floodplain and on the west by Banff National Park. Elevations on the developable portions of the site range from approximately 1350 metres to 1550 metres.

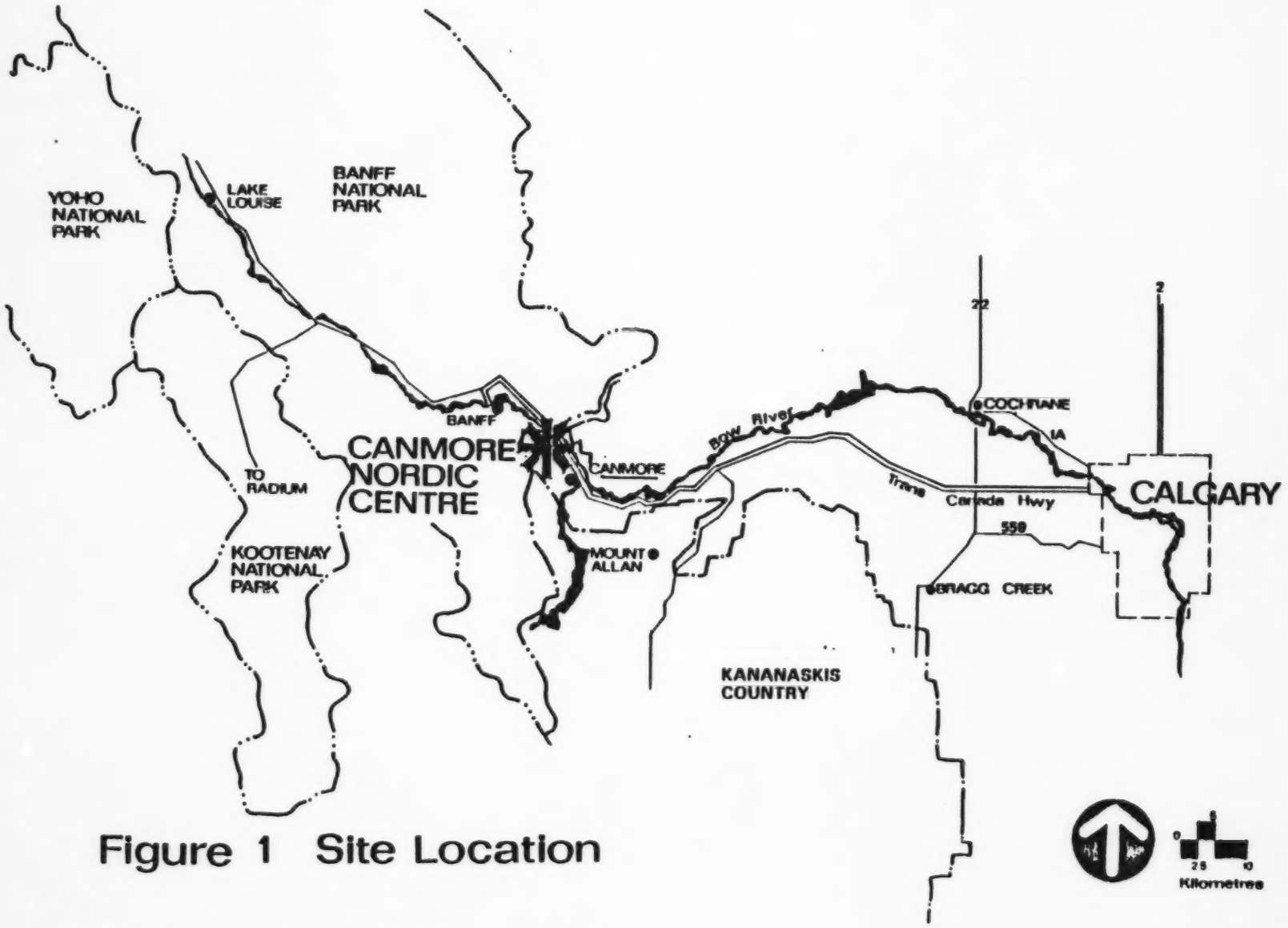


Figure 1 Site Location

Historically, the site has been extensively used for both recreational and resource extraction purposes. In the early 1900's, the site represented an important coal mining centre. The Georgetown community developed just above the Bow River floodplain to support the mining activities. Although almost totally reclaimed, remnants of Georgetown and coal mining can still be found on site. From a recreational standpoint, the area is well used by hikers and cross country skiers.

Characteristics of the site which make it well suited to the proposed development program include good snowfall and snow retention, undulating topography, proper aspect and elevation, and heavy forest cover. Located adjacent to the Town of Canmore, the site has the added advantage of being close to existing infrastructure and services which will play an important part in enhancing the viability of the site.

4. Purpose:

The purpose of this executive summary is to describe the key elements of the Canmore Nordic Centre Master Plan. This will include a description of objectives, requirements and criteria, process, conceptual site plans for stadium and trails development, operational strategies and options, environmental protection plan, implementation strategy and schedule, and costs.

It is important to understand that the master plan is not a basis for initiating construction but rather a basis for proceeding with the detailed design phase of the implementation process. The master plan provides a comprehensive framework for

defining and implementing the many aspects of site development and operation, but does not preclude the need to more extensively evaluate each component of the program.

5. Objectives:

A number of objectives for the Canmore Nordic Centre project were established in order to achieve the many requirements identified by the Alberta Government and OCO'88. These objectives formed the basis for initiating the master plan and have been used throughout the planning process as a means of evaluating program options.

Primary Objectives:

- To ensure that the technical and other requirements associated with hosting the 1988 Olympic Winter Games are met;

- To provide long term recreational, training and competition opportunities on site;

- To effectively integrate short term Olympic needs and long term competition, training and recreational needs in a sensible and cost efficient manner;

- To ensure that facilities will be available for hosting pre-Olympic competitions in 1986-87.

Other Objectives:

- To maximize the beneficial effects to the Town of Canmore and minimize any potential negative impacts;

- To minimize conflicts between the different user groups on site;

- To maximize use of the site on a year-round basis;

- To create a facility which is operationally efficient;

- To minimize wildlife and other potential environmental impacts;

- To minimize potential negative influences of climate;

- To minimize physical disturbance to the land base and to enhance the visual properties of the site;

- To maintain the highest degree of compatibility possible with the policies, guidelines and standards established for Kananaskis Country.

The master plan will reflect that all of the stated objectives have been achieved to the highest degree possible and practical.

6. Master Plan Participants:

An Alberta Government Steering Committee was formed in 1983 to direct the planning process for the Canmore Nordic Centre project. This committee had three primary responsibilities:

- To establish the terms of reference for the project;

- To provide technical advice relative to the planning, design and implementation of the project;

- To provide direction on, and monitor the preparation of the master plan.

One important function of the Steering Committee was to represent the various interest groups as related to meeting the requirements of hosting Olympic and other competitions, training and recreational pursuits.

Membership on the Alberta Government Steering Committee was as follows:

Alberta Olympic Secretariat
Alberta Public Works, Supply and Services
Alberta Transportation
Kananaskis Country
Canadian Ski Association - Cross Country
- Biathlon
OCO'88
Town of Canmore

N.B. The Special Committee for the Review of Wildlife and Environmental Matters provided input on wildlife and other environmental aspects of the project as required.

Carson-McCulloch Associates Ltd. of Calgary was selected as the prime consultant to prepare the master plan for the Canmore Nordic Centre project. Carson-McCulloch assembled a comprehensive team of local firms and recognized specialists needed to successfully accomplish the objectives of the master plan. The consultant team and general responsibilities are outlined as follows:

Carson-McCulloch Associates
- Project Management and Master Planning

Lavalin
- Infrastructure Planning

Clark James Coupland and Partners
- Architectural Planning

Pannell Kerr Forster Campbell Sharp
- Market Analysis and Operational Planning

Sno-Engineering Inc.
- Snow Making and Facility Design

Bios Environmental and Planning Assoc. Ltd.
- Wildlife Biology

Biological Research Services
- Environmental Planning

Bjorger Pettersen
- Cross-Country Specialist

Bill Brooks
- Biathlon Specialist

Don Gardner
- Recreational Trail Specialist

N.B. The master plan team had the added benefit of receiving input via OCO'88 from other individuals who are internationally recognized for their expertise in planning, designing and operating Olympic nordic sites.

PART II PLANNING PROCESS

1. General:

The planning process for the Canmore Nordic Centre Master Plan has required special attention to a unique variety of needs. The complexity of the planning has related primarily to the careful integration of the identified short term (i.e. Olympics) and long term requirements of the site while meeting the objective of ensuring operational and economic efficiencies.

The process undertaken by the consultant has consisted of a five part program including:

- Establish Planning Parameters
- Inventory and Analysis
- Site Selection and Development of Planning Options
- Conceptual Design of Base Facilities and Trails Corridors
- Preparation of Operations, Environmental, Implementation Plans and Other Relevant Master Plan Support Information

While the site was recognized as having many attributes conducive to developing an excellent quality nordic site, two factors were identified as posing potential

constraints to the master planning. There were certain limitations to the actual amount of area available for development, and more importantly with the amount of high quality ski terrain which could be utilized for competition trail systems. As the quality of the trail systems is critical to successfully hosting the Olympic cross country and biathlon events, considerable attention was given to maximizing the use of the best available terrain for trails development. This did not, however, negate the need for proper siting and organization of the complementary stadium facilities.

2. PLANNING PARAMETERS:

The primary reason for developing the Canmore Nordic Centre site at this time is to accommodate the hosting of the 1988 Olympic Winter Games. The primary purpose of the site is to create a facility which is viable in the long term as a recreational, training, and competition site.

A number of planning parameters were identified on the basis of Olympic competition needs and were then balanced against longer term uses for the site. This assisted in determining both the scope of the program and the extent to which it would be developed as a permanent installation. It is fair to assume that whatever facilities and opportunities are created for Olympic purposes will generally satisfy ongoing training and competition requirements for cross country and biathlon athletes. It is also assumed that most recreational uses of the site will be able to be accommodated within the facility program established for the Olympics; operating the site in such a way that each user group is provided with high quality opportunities without conflicting with other users is the key to meeting the overall requirements.

Several facilities and activities associated with hosting the Olympics and other competitions have been identified. It is important to note that most of the requirements, with the exception of the trails systems, can be met with temporary facilities, providing there is adequate access and space. Therefore, the development of permanent facilities is judged according to the type and extent of long term uses and what facilities can be justified on the basis of demand. All permanent facilities will be available to Games organizers for Olympic competitions and appropriate spaces will be identified for all temporary facilities. OCO'88 will be responsible for providing all temporary facilities.

Olympic Requirements - General:

- cross country trails (minimum 30 kilometres);
- biathlon trails (minimum 17.5 kilometres);
- biathlon shooting range, with baffle and butts (minimum 30 targets);
- stadium area(s) for competition start and finish, with sufficient area for spectators, media, coaches, officials, etc.;
- training and wax-testing tracks;
- officials' huts, ski marking and rifle checking huts;
- scoreboard at start/finish area(s);
- team rooms (waxing rooms) for biathlon and cross country competitors;
- bleachers for spectators;
- broadcast booths;
- media trailers;
- timing room;
- jury room;

- press sub-centre and press corrals;
- manufacturer service trailers;
- television camera locations;
- parking and bus staging area;
- doping control centre;
- race headquarters;
- V.I.P. lounge(s);
- snowmaking capacity;
- equipment storage and service roads;
- volunteer centre;
- helicopter landing area;
- fences, trail gates, signage;
- support facilities for spectators such as food concessions, washrooms, warming areas, etc.;
- power, sewer, water, telephone.

As noted previously, many of these requirements can be met with temporary installations. These installations would then only require prepared space on site which has the proper relationship to the facilities and areas necessary.

Competition Requirements - General:

- same as Olympic requirements to greater or lesser degree; any additional requirements would be of a temporary nature.

Training Requirements - General:

- trail systems and associated facilities as provided in Olympics program;
- a hard surfaced, lighted training track for summer training;
- classrooms, meeting rooms, lockers and other instructional facilities.

Recreational Requirements - General:

- recreational trail systems for cross country and hiking - a limited number of connector trails are required in addition to the competition trail systems;
- picnicking facilities (e.g. tables, firepits, garbage, etc.);
- public cafeteria, washrooms, and warming area(s);
- interpretive program;
- permanent parking.

Infrastructure and Service Requirements - General:

- primary access road and internal circulation roads;
- maintenance compound;
- water, power and sewer;
- solid waste collection;
- site lighting in core facility area;
- snowmaking system.

Once the basic program requirements had been identified, the next step was to determine which facilities could be permanent developments and which ones should be. One specific objective was to minimize redundancies in program, both on site and off-site (e.g. Kananaskis Country, Town of Canmore). The intent was to complement, not compete, and to ensure that program decisions are economically sound.

3. Inventory and Analysis:

A comprehensive inventory and analysis was undertaken to obtain quantitative and qualitative information on the site and program. Information was assembled on the basis of some original research, a review of existing reports and studies, interviews with relevant individuals and agencies having knowledge of the site, and field reconnaisance by members of the consulting team. The analysis related to four key areas of examination: a) physical site characteristics, b) market, c) program requirements, and d) facility requirements. A brief description of each of these components is described as follows.

a) Physical Site Characteristics:

A detailed investigation of the physical land base is essential to determining the site's capabilities and suitability for specific development programs. It provides an opportunity to identify the best possible opportunities on site as well as any constraints which may affect design and layout.

Specific areas of investigation have included geology, hydrology, topography, vegetation, wildlife, climate, visual qualities, and existing infrastructure.

Geology:

A geotechnical investigation was undertaken to assess the development capability of the site, primarily from a construction standpoint. Bedrock geology and surficial geology were evaluated in detail. The potential for erosion, high groundwater levels and avalanche hazards were also considered as was the potential impact of previous mining activities.

A terrain analysis map of the site was prepared on the basis of four classes, which identified a range of least to most developable zones on site.

Hydrology:

An analysis of hydrology and hydrogeology on the site included investigations of the Bow River regime at Canmore, drainage patterns, flows of intermittent streams across the site and the effects of groundwater discharge throughout the site. Mapped information includes major sub-region watersheds, the Bow River 100 year floodplain and four ranges of potential groundwater yield.

Topography:

A detailed analysis of slopes and gradients on the site was undertaken and mapped according to five categories. Different components of the site program

have minimum and maximum slopes which are most suitable for development. The slope analysis assisted in determining the most suitable natural terrain for both facility and trails construction.

Vegetation:

Vegetation on the site has been catalogued and mapped with the intent of providing the most useful possible information for planning and management purposes. Information derived from this analysis assists in identifying wildlife habitats, soil conditions, climatic influences, and general development suitability.

Wildlife:

The primary objective of the wildlife component of the master plan process has been to minimize and control possible negative effects which the development program might have upon fish and wildlife. To provide an information base to assist with the planning and management decisions, the site had been zoned into varying levels of wildlife habitat for ungulates. Movements corridors have been identified as well as mineral licks currently in use by ungulates. Fisheries resources in the Bow River have also been analyzed.

Climate:

The effects of wind and the dependability of snow cover are critical to the successful operation of a nordic ski facility. A number of factors were

considered in identifying where shelter from wind and good snow cover could be assured, and alternatively areas where snow farming could be considered. Influencing factors include aspect, surrounding peaks, benchlands and forest cover. Consideration of these factors resulted in the mapping of four consecutive zones representing excellent, good, fair and poor climatic characteristics.

Visual Analysis:

The primary objective of the visual assessment was to minimize any negative views of the site from the Town of Canmore and the Trans-Canada Highway and to maximize potential viewing opportunities from within the site. Potential visual impacts off site were deemed to be positive, therefore the analysis focused on internal viewing areas. Seven categories of viewing area were mapped, ranging from fair internal viewpoints to broad panoramic views of the Rundle Range and the Bow Valley.

Existing Infrastructure:

In addition to existing mine scars, access roads, remnants of the old mining community of Georgetown and the abandoned alpine ski hill, the only existing infrastructure which has a bearing on the master planning are the roads and services adjacent to the east end of the site. These services include power, gas, telephone, a microwave tower and reservoir and have been mapped in relation to the site and the Town of Canmore.

Hook-up utility services within the Town of Canmore have also been identified in order to allow an assessment of the feasibility of tying into Canmore infrastructure as opposed to developing independent systems on site.

b) Market Analysis:

A general market analysis was undertaken to determine the long term demand for competition, training and recreational use of the site. With respect to competition and training, the analysis assisted with determining the type and extent of use, therefore offering direction on the permanent facility program requirements and operations of the site. From a recreational standpoint, an assessment of supply/demand for cross country skiing, particularly in the Canmore region, was provided to gain a better understanding of potential recreational demand at the site.

One of the objectives of the master plan was to maximize use of the site on a year round basis and therefore numerous potential summer and other winter recreational programs were identified and assessed. The assessment was based on the capacity of the site to accommodate numerous, different activities as well as the compatability of the activities with the primary nordic program, and each other.

The market analysis provided an important tool for defining overall program requirements and developing an operational strategy for the site following the hosting of the Olympic Winter Games in 1988.

c) Program Requirements:

Concurrent with the assembly and mapping of detailed site and market data, several levels of programming information were developed, using the preliminary program parameters established. This essentially enabled a more detailed definition of the nordic program requirements, both from a content and context perspective.

The following general principles, common to most world class nordic facilities of this kind, were utilized as basic criteria in the layout and evaluation of planning options:

- to minimize potential conflicts during competitions and training, biathlon and cross country trail systems should be able to function independently;

- to ensure acceptable trails profiles, stadium sites should be located as low on the terrain as possible;

- stadiums should be in close proximity to the highest quality ski terrain available;

- stadium areas, the biathlon shooting range and trail corridors should be protected from the wind;

- orientation of the biathlon shooting range should be between NW (270 degrees) and due North (0 degrees);

- trail systems should be located in areas of optimal snow retention;

- core areas should be shared by cross country and biathlon sports to the highest degree possible;

- viewing opportunities for television broadcasting and spectators should be optimized;

- distances between biathlon and cross country spectator areas should be minimal.

d) Facility Requirements:

Satisfying two different operational requirements on site necessitated coming up with the optimal mix of permanent and temporary facilities. Permanent base facilities which will be required to ensure long term viability and use of the site as a recreational, training and competitive ski centre had to be identified. As well, to permit the proper hosting of a major world class competition, specifically the 1988 Winter Olympics, a range of temporary facilities had to be accommodated within the site program. From a site planning standpoint, the greatest challenge has involved creating a facility which efficiently satisfies both major operational situations without resulting in costly overdesign during low use periods, or overtaxing a limited infrastructure and resulting in unnecessary congestion during major events.

On the basis of preliminary program identification, the development program was further defined to describe permanent and temporary components and the scope of these requirements. Further refinement of the type and scope of the facilities will be undertaken in the detailed design stage of implementation, but the following outline is representative of the overall requirements to be accommodated at the Canmore Nordic Centre site:

Permanent Facilities:

* Stadium Buildings:

- A main building of approximately 1000 square metres (10,000 square feet) to accommodate basic public service and training and competition functions.

- A building adjacent to the biathlon shooting range of approximately 70 square metres (700 square feet) to accommodate additional, limited competition and training functions.

- One or two structures to accommodate approximately 12 team rooms for use by athletes and officials.

- Several small structures for competition purposes, such as ski marking, rifle checking, etc.

* Maintenance Building:

- A building of approximately 20 square metres (2000 square feet with a fenced compound for servicing the site and providing general equipment maintenance and storage.

* Biathlon Shooting Range:

- A shooting range to accommodate approximately 32 targets.

* Biathlon Trails:

- Approximately 20 kilometres of competitive biathlon trails.

* Cross Country Trails:

- Approximately 32 kilometres of competitive cross country trails.

* Recreational Trails:

- Approximately 10 kilometres of recreational trails to complement the competition trails and to provide connectors to the Town of Canmore and Banff National Park.

* Training Trails:

- Approximately 2.5 kilometres of summer training track for roller skiing.

* Outdoor Seating:

- Bleacher type structures to seat approximately 500 spectators.

* Parking:

- On site parking to accommodate 175 cars and an overflow parking lot with a 125 car capacity. Limited bus parking and staging can be accommodated within these areas.

* Snowmaking:

- Snowmaking capacity at the maintenance compound to make and stockpile snow for distribution along the trail systems if necessary.

* Scoreboards:

- A main scoreboard(s) at the start/finish area(s) which can be viewed by spectators, media, officials and athletes.

* Primary Infrastructure:

- The upgrading of the primary access road from the town of Canmore to the entrance to the site, a distance of approximately 1.8 kilometres.

- The provision of primary power, water, sewer and telecommunications. Peak demands of the Olympics will be handled through temporary systems.

- Internal circulation and service roads to provide access to facilities and trail systems.

- Solid waste disposal collection system.

* Support Facilities:

- All necessary support facilities for trail systems such as gates, signage, overpasses, etc. and for the site in general. The latter relates to such items as site furnishings, lighting, signage, fencing, etc.

Temporary Facilities:

The following listing represents those facilities which will be required over and above the permanent facilities and will be accommodated on a temporary basis for hosting the Olympic Winter Games. Prepared space on site will be provided and will be located so as to maximize each function.

- 55 stacked broadcast booths
- television camera locations
- six media trailers
- doping control centre
- 40 team waxing trailers

- officials' washrooms and warming areas
- public washrooms and warming areas
- public concessions
- course stations (interval timing, refreshments)
- press sub-centre
- security station
- manufacturer service trailers (near waxing area)
- press corrals at start/finish area(s)
- photo pens at points along course
- spectator locations at points along the course
- volunteer centre
- helicopter landing area
- bus staging area
- flag staging area
- awards presentation area
- spectator medical service
- spectator information
- souvenir concession
- vehicle and spectator control mechanisms
- signage
- telecommunications
- bleachers

For planning purposes, it has been assumed that 250 athletes and approximately 5,000 spectators will be present during the nordic events in 1988. In addition, it is estimated that officials and other technical and support people (e.g. media, organizers, volunteers, suppliers, etc.) will number 1,000.

Potential Future Expansion:

During the course of addressing program requirements and options, two additional programs were identified. These were not deemed to be essential to the operation of the site and were not judged to be justifiable components of the development program at this time. Responsible planning incorporates some flexibility for expansion in an appropriate manner and accordingly potential locations for an athlete training centre and a training jump (approximately 25 metres) have been tentatively located on site.

It is not the intent of the Alberta Government to design or construct these two additional facilities as a part of the Canmore Nordic Centre development program.

4. Site Selection and Development of Planning Options:

On the basis of the analysis and inventory stage of the planning process, specific program requirements were identified. The opportunities and constraints of the site as related to implementing the program also became evident.

Limitations in developable site area and the quantity of natural, high quality ski terrain suggested in the early stages that the entire Canmore Nordic Centre site would have to be used to satisfy trails requirements. As well few locations of acceptable slope on the site were large enough to accommodate the base facilities.

With regard to these constraints, the site selection process, by necessity, concentrated first on locating the most feasible areas for range and stadium development. Trail planning during this initial phase involved the classification of available ski terrain into a series of suitability designations. After the evalution of possible stadium sites according to a variety of site specific criteria, conceptual trails corridors were examined from each possible stadium location.

The method used in identifying potential stadium locations involved a synthesis of inventoried site data and specific program requirements for base facilities. This synthesis has been presented in two separate formats, "site capability" and "site suitability".

"Site Capability" is determined by the relative ability of the site's physical land base, in its present form, to support the type and level of development proposed. Stable areas requiring little modification to make them developable are rated high on the scale of capability; while areas which are subject to erosion, slumping, avalanche hazard, excessive slopes, etc., or requiring major changes to the existing landscape to make them usable are rated low in terms of capability.

"Site Suitability" refers more to the qualitative aspects of the site which have a bearing on facility location and layout. This relates more to where the facilities should be built, as opposed to where can they be built. In this evaluation, criteria such as aesthetic qualities, proximity to existing infrastructure, presence of important environmental and cultural resources, etc. are applied. It should be noted that while a specific area may rate high in terms of its "Capability" to support development, it may on the other hand be judged unsuitable or inappropriate for qualitative reasons.

The result of the quantitative and qualitative assessment was the identification of six distinct site areas which displayed varying degrees of "Capability" and "Suitability" for accommodating base facilities. From these initial six areas, three potential stadium locations were selected on the basis of their size, elevation and proximity to good ski terrain.

Conceptual site layouts were subsequently prepared for each of the three potential sites in order to further assess their potential from a functional perspective. More substantive criteria was applied at this stage and one site was selected as being the optimal location for stadium development.

The site chosen for stadium development is located at the eastern end of the study area, directly off the Smith-Dorrien/Spray Trail and contains an area of approximately 7.63 hectares (19 acres). The site has two relatively level areas suitable for stadium location, is in close proximity to Class 1 ski terrain, and is easily accessible to existing infrastructure and the Town of Canmore. It is also not located in an area of valuable wildlife habitat.

PART III CONCEPTUAL MASTER PLAN

The purpose of the master plan is to provide a conceptual framework for the development of the Canmore Nordic Centre. Having considered numerous site specific opportunities and constraints, facility needs and operational objectives, it identifies in general terms, the optimum fit between a complex set of program requirements and an established land base. The master plan is a tool to be used in directing and ensuring continuity throughout the detailed design stages and it is also a strategy for realizing a world class legacy.

The master plan is described as four major components: 1) Stadium Layout, 2) Trails Systems, 3) Stadium Operations, and 4) Environmental Mitigation Plan.

1. Stadium Layout:

Layout of the proposed stadium as described in this section is the summation of a lengthy process of design, analysis, evaluation and redesign. The design represents the "best fit" between the combination of different and in some respects, conflicting site functions, the diverse range of facility requirements and the land base. The potential for conflict is naturally the greatest during a major sporting event when two sports must train and compete concurrently and when spectator and support functions are at their peak.

The general principles which were applied in preparing the stadium layout included:

- maximize the use of natural terrain;
- minimize redundancies in program requirements for the two sports and for recreational purposes;

- maximize operational efficiencies as related to hosting events, training and recreational;
- provide for the proper placement of all temporary facilities and activities.

The stadium layout represents a compromise between a truly combined cross country and biathlon stadium, where the start and finish lines for both sports would be in the same location, and totally separate facilities. This design concept evolved on the basis of perceived long term demand and operational viability, but to some degree was influenced by the natural "lay of the land". This design does not though preclude the opportunity to host events from a common start/finish line.

The proposed stadium layout is based upon the need to utilize the site area as effectively as possible, combine centralized support facilities conveniently for both sports, and at the same time, allow autonomy in cross country and biathlon operations.

Stadium Components:

To facilitate consistent evaluation of planning alternatives, individual components or "building blocks" of the required stadium area have been identified and analyzed in terms of their relationship to major user groups.

Figure No. 2 illustrates the complexity of functional relationships which must be considered during a major competition. The left column lists the 15 main space consuming facilities which must be arranged, while the seven groups listed on the top identify primary users. Graphic symbols on the chart indicate the importance of the relationship between particular user groups to specific facilities.

● CRITICAL RELATIONSHIP
◕ STRONG RELATIONSHIP
◑ MODERATE RELATIONSHIP
⊕ WEAK RELATIONSHIP

	BIATHLON ATHLETES AND COACHES	X-C ATHLETES AND COACHES	V.I.P.'S AND OFFICIALS	SPECTATORS & RECREATIONAL SKIERS	MEDIA	EQUIPMENT SUPPLIERS	MAINTENANCE STAFF
1. START FINISH	◕	◕	●	◕	●	◑	◑
2. STADIUM INFIELD	◕	◕	●	◕	●	⊕	◕
3. DAY LODGE	◑	◑	◕	◑	◑	⊕	◕
4. BIATHLON TRAILS	●	⊕	◑	◑	◑	◑	◕
5. CROSS COUNTRY TRAILS	⊕	●	◑	◑	◑	◑	◕
6. SHOOTING RANGE	●	⊕	◕	◕	◕	⊕	◑
7. WAX TESTING TRAILS	◕	◕	⊕	⊕	⊕	◕	◑
8. CROSS COUNTRY TEAM ROOMS	⊕	●	⊕	⊕	⊕	◑	⊕
9. BIATHLON TEAM ROOMS	●	⊕	⊕	⊕	⊕	◑	⊕
10. MEDIA TRAILERS	⊕	⊕	⊕	⊕	●	⊕	⊕
11. BROADCAST BOOTHS	⊕	⊕	◑	⊕	●	⊕	⊕
12. TEMPORARY FACILITIES	⊕	⊕	⊕	●	⊕	⊕	⊕
13. SUPPLIERS TRAILERS	◕	◕	⊕	⊕	⊕	●	⊕
14. PUBLIC STAGING & PARKING	⊕	⊕	◑	●	◑	⊕	⊕
15. MAINTENANCE COMPOUND	⊕	⊕	⊕	⊕	⊕	⊕	●

Figure 2 Facility/User Relationships

This chart illustrates a priority list of stadium elements ranging from those which must be easily accessible to the greatest number of users and therefore central to the development, to those which satisfy single functions and whose location is less critical.

In order of priority, the fifteen major components of the stadium area include:

- start finish line(s)
- stadium infield(s)
- day lodge
- biathlon trails (within stadium area)
- cross country trails (within stadium area)
- biathlon range
- wax testing trails
- cross country team rooms
- biathlon team rooms
- media trailers
- broadcast booths
- temporary public facilities
- suppliers trailers
- public staging area
- maintenance compound

Based upon the foregoing analysis, the following relationship diagram (Figure 3) represents a model stadium layout for the Canmore Nordic Centre.

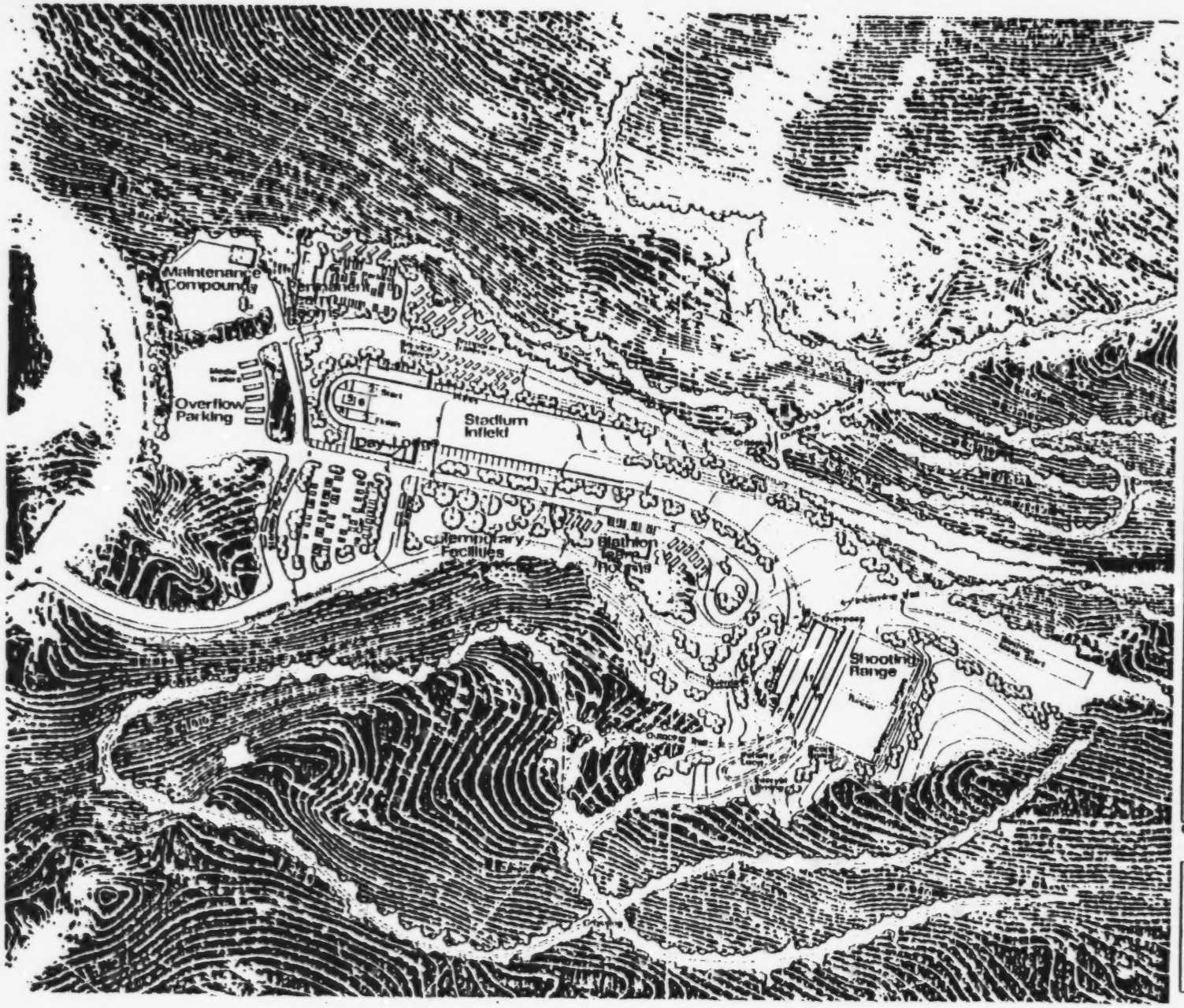
Figure 3
Stadium Relationship Diagram

Proposed Stadium Layout:

The stadium layout illustrated on Figure 4 represents an optimum organization of required facilities as related to the Canmore Nordic Centre site. It provides ample space and infrastructure for accommodating all required temporary facilities for hosting the 1988 Winter Olympic Games, and as well ensures an attractive, efficient layout for any ongoing recreational training or competitive functions. In addition, it has been designed to permit a range of operational scenarios at the discretion of individual race organizers.

Access and circulation for specific user groups is well defined with a minimal potential for conflict and extensive traffic control. Facilities are sited so as to optimize viewing opportunities for both spectators and the media and to take advantage of natural site features.

Overall, the legibility, functional efficiency and natural attractiveness of the Canmore site should ensure a nordic ski facility second to none.



Canmore Nordic Centre

1 X Country Ski Markings
2 Warm Up Area
3 Ski Check Area
4 Blankets / Refreshments
5 Press Pen
6 Officials Area
7 TV Camera
8 Broadcast Booths
9 Timing Building
10 Ski & Rifle Check
11 Press
12 TV Location
13 Broadcast Booths
14 Ski Marking
15 Rifle Check
16 Clothes Storage
17 Warm Up Area
18 Coaches
19 Officials

Fig. 4

Carson McCulloch Associates Ltd.

PROPOSED STADIUM LAYOUT

Architectural Program:

The Architectural Program for the permanent base facilities must serve the same dual role as the rest of the venue, i.e.: it must accommodate the 1988 Winter Olympics' nordic events and other competitions. It must also provide an ongoing facility for the training of cross country and biathlon athletes at an international level, as well as a permanent facility for the recreational skier.

The program consists of four primary structures and a selection of minor shelters. Each component of this program has a specific function with a specific relationship to each other and its location on the site.

Day Lodge:

This is the principal structure at the nordic venue. It is the largest of the built forms and is intended to serve a variety of functions, hosting competitive events, serving base training functions and recreational uses. Located in close proximity to the start/finish line at the main stadium area, the day lodge contains functions that are associated with cross country races; the race timing, the race announcer, the senior race officials' offices and an information dissemination centre. As well, there are permanent food service facilities, a V.I.P. lounge, building maintenance functions and storage for the movable equipment required in the stadium area. The food services and lounge will be used by all the user groups.

In the post-Olympic stage it is anticipated that the day lodge will be used simultaneously by biathlon and cross country ski teams during training programs and top level competitions. Public users will include spectators and recreational skiers.

The total area allocated to the day lodge is 1013 m^2.

Biathlon Shooting Range:

A shooting range approximately 50 m x 90 m, with butts, baffles and berms will provide up to 36 targets. Recent information suggests that a minimum of 30 targets plus two spare targets will meet Olympic requirements. The range is oriented almost due north, which is optimal. Range orientation is critical in terms of ensuring that competitors have the sun at their backs while shooting.

Biathlon Stadium Building:

This building is located adjacent to the shooting range and presents a small multi-purpose function for both Olympics and post-Olympic use. It will allow biathlon events to operate completely separate from cross country during competitions. Containing washrooms, timing facilities, and a multi-purpose meeting room, this building could be combined with bleachers or viewing platforms to form a single structure.

Total area required for this building is estimated at 67 m^2.

Permanent Team Waxing Rooms:

These rooms are used during competitions or training for purposes of holding team meetings, storing extra equipment and ski waxing. There can be up to 24 people in the room at any one time for a meeting, or 5 people for waxing skis.

Twelve permanent team rooms are planned, 8 south of the main stadium for use by cross country and 4 in the area of the biathlon range.

Total area allocated is 408 m^2.

Maintenance Building:

This structure contains many functions related to trails' maintenance and to the storage and repair of the associated equipment.

The maintenance component includes storage and minor services of course equipment on an ongoing basis. Any major repairs will likely be performed off-site. An outdoor storage compound is also required adjacent to the building.

Total area required for this building is 235 m^2.

Ski Marking Hut:

This is a shed, open at both ends, where the competitors ski in one end, have their equipment checked and labelled (painted) by officials, then proceed out the other end into the pre-race warm-up area. This hut serves as a control point for the racers who once having gone through it, are in a controlled area and must proceed into the start area.

Biathlon Shooting Range Officers' Hut:

A small shelter for the Chief of the Range to confer with his Range officials (estimated 6 people) and be sheltered from the elements during a competition.

Biathlon Penalty Loop Controller's Hut (3):

These are small shelters around the Penalty Loop to shield the controllers during a competition.

Warm-Up Clothing Shelter:

This is a long rack to keep the competitors' warm-up clothes dry when they are on the course. It is accessible from both sides and is sited after the ski marking hut and before the stadium.

INFRASTRUCTURE DESIGN:

Roadways:

The on-site roadway system comprises: the entrance road (from the Smith-Dorrien/Spray Trail intersection to the day lodge building), which consists of 10.5 m wide paved road; the bus loop which provides unloading/loading capacity for a minimum of 10 buses; the internal circulation road system which links the various buildings of the sports complex with 7 m wide paved road; and the on-site service road system which links the stadium area to the west end of the site via a 6 m wide gravel surfaced road.

Parking:

A permanent parking lot with a capacity for 118 vehicles is located in front of the day lodge building. This parking will be paved, curbed, lighted, and have 50 vehicle-heater receptacles. The parking at the permanent team rooms can accommodate a total of 70 vehicles. These parking areas will be paved and lighted. All other parking areas, including the overflow parking and the maintenance compound parking will be surfaced with gravel.

Potable Water Supply:

The potable water for the Canmore Nordic Centre is proposed to be supplied by the Town of Canmore filtration plant in Rundleview Estates. The water will be withdrawn from a proposed main water line servicing the town centre and pumped during their

low demand period via a new booster pumping station to an on-site underground reservoir. This reservoir would be located at an elevation to supply water by gravity to the facilities at service pressure. As a minumum, water distribution lines will be 150 mm and 200 mm where larger fire flows are expected.

Sewage System:

The sewage treatment for the site is proposed to be provided by the Town of Canmore treatment plant. The sewage would be collected by 200 mm gravity sewer pipes with the exception of the sewage from the biathlon stadium building (due to its low elevation location) which will be pumped through a 50 mm forcemain to the gravity system at the biathlon team rooms area. The gravity sewer lines leaving the site will follow SR 742 and drop to Rundleview Estates sewer mainline.

Power Supply and Distribution System:

Electric power will be provided from Trans Alta's 138 KV line located at a point close to the Town of Canmore water filtration plant. The power will be transmitted via aerial lines along S.R. 742 to the intersection with the site entrance road. From this point all power lines on-site will be underground.

The power will be distributed along site roads to all permanent buildings and facilities. It is assumed that power supply to interval timing and possible T.V. locations throughout the site will be optional and if required, will be supplied by events organizers.

Snowmaking System:

Snowmaking capacity is an Olympic requirement and will be provided for the Canmore Olympic cross country and biathlon trails, if required. The location of the site on the northeastern slopes of Mount Rundle subjects the trails to some exposure from warm Chinook winds blowing in from the Spray Lakes Valley. This could impact on snow cover in the eastern end of the site where the stadium and biathlon courses are located. To guarantee adequate snow cover for the 1988 Olympic cross country and biathlon events, as well as enhancing the continuing use of the Canmore facilities, an artificial snowmaking system is being proposed. This snowmaking system would provide for snow stockpiling operations in which snow would be produced and stored in large piles. This snow would then be trucked to various locations on the site and the cross country and biathlon courses if required during important events such as the Olympics.

The actual snowmaking process is proposed to be achieved by pumping water from the Rundle Forebay reservoir through welded steel pipelines and using a compressed air/water system.

The actual type and extent of snowmaking capacity will be further investigated and evaluated in terms of providing the most economical and efficient system. At a minimum, stockpiling snow will be available on the site in the event of poor snow conditions.

Natural Gas Distribution System:

Natural gas is proposed to be provided to the site from an existing main gas line in Rundleview Estates via a new main line along the Smith Dorrien/Spray Trail.

The on-site distribution network will be along the roadways to service all permanent buildings.

Communication System:

The permanent communication system has three components: the telephone/ telecommunication lines system, the site maintenance/operation radio system, and the public address system.

Telephone/Telecommunication Systems:

Telephone service will be provided by Alberta Government Telephones (A.G.T). A.G.T. will provide up to 200 cable pairs from their Canmore Switching Centre to the stadium area.

The site communication network will include phone services to each permanent building, phone communication between the Biathlon Shooting Range and other building areas, as well as a 25 cable pairs distribution network along the cross country ski trails to service intermediate timing points and potential camera locations.

Additional telecommunications requirements will be the responsibility of Games organizers.

The need for a public address system and site operations radio system have also been identified and conceptually defined.

Solid Waste Disposal System:

The solid waste disposal system for the permanent facilities will consist of approximately eight bear-proof hydraulic bins. These will be located as follows: one at the maintenance compound, two at the permanent cross country team rooms, one at the day lodge (kitchen area), two at the main parking. one at the permanent biathlon team rooms, and one at the biathlon stadium and shooting range area.

2. Trail Systems:

The Cross Country, Biathlon and Nordic Combined trail programs developed for the Nordic Centre are largely predicated on satsifying the requirements of Olympic calibre competition. Analysis of courses used for previous Olympic meets in combination with the experience of the consulting team yield an identified need for at least 30 km of cross country and 17.5 km of biathlon course.

These are to be supplemented with recreational hiking and ski trails for use both during and after major competitions.

In total, some 60 km of trail are proposed. 32 km of competitive cross country courses are located throughout the upper portion of the site and will be able to accommodate trails requirements for the nordic combined event. 20 km of biathlon trail loops are laid out below and to the west of the proposed shooting range. Approximately 10 km of recreational trails run through the site connecting the stadium area both to the Town of Canmore and Banff National Park.

The guiding principles governing the overall planning of trail systems have included:

- keeping biathlon and cross country trails completely separate;
- optimizing the best available ski terrain and snow conditions;
- providing technically demanding competitive courses for world class athletes;
- providing challenging courses for a range of competition and training programs;
- creating trails with a truly "Canadian Character";
- optimizing spectator and media viewing opportunities.

In more specific terms, it must be recognized that the layout of each competitive trail is a three dimensional exercise. Not only must the courses be of precise length, they must as well conform to a number of specified elevational criteria and performance standards. While F.I.S. regulations leave considerable latitude for the development of individual character on trail systems, failure to address these standards would likely result in a less than internationally acclaimed facility, and could affect final approval of the trail system by technical delegates of the international ski bodies. Considerable care has therefore been taken to ensure that the courses designed will meet these minimum standards.

In addition to the maximum elevation requirement of 1800 m above which none of the trails must ascend, there are recognized criteria which must be observed for maximum height difference, maximum climb and total climb for each proposed course.

There are as well a number of general characteristics, shared by the world's leading facilities, which have acted as models in the design of competitive trails at the Canmore Nordic Centre. These represent both long established traditions in international ski organizations, and also respond to recognized physiological effects upon racers. Primary among these are:

- avoiding long downhill runs directly after the start of a race. In cold weather this can result in serious problems for racers whose competitive clothing is very thin, and who haven't been given ample opportunity for warming up.

- notwithstanding the above, avoiding long downhill gliding finishes which can result in a disproprortionate number of tied races. A very gradual assent to the finish allows for exciting races, and ensures that the strongest athletes will finish first.

- developing an overall profile for each course which allows racers to gradually raise their heart rates, challenges them at key intervals throughout the race, and allows them to race back to the stadium.

The trail systems are shown on Fig. 5 and include cross country, biathlon and recreational trail alignments. The trails corridors which have been mapped are conceptual in nature and will require significant refinement in the detailed design

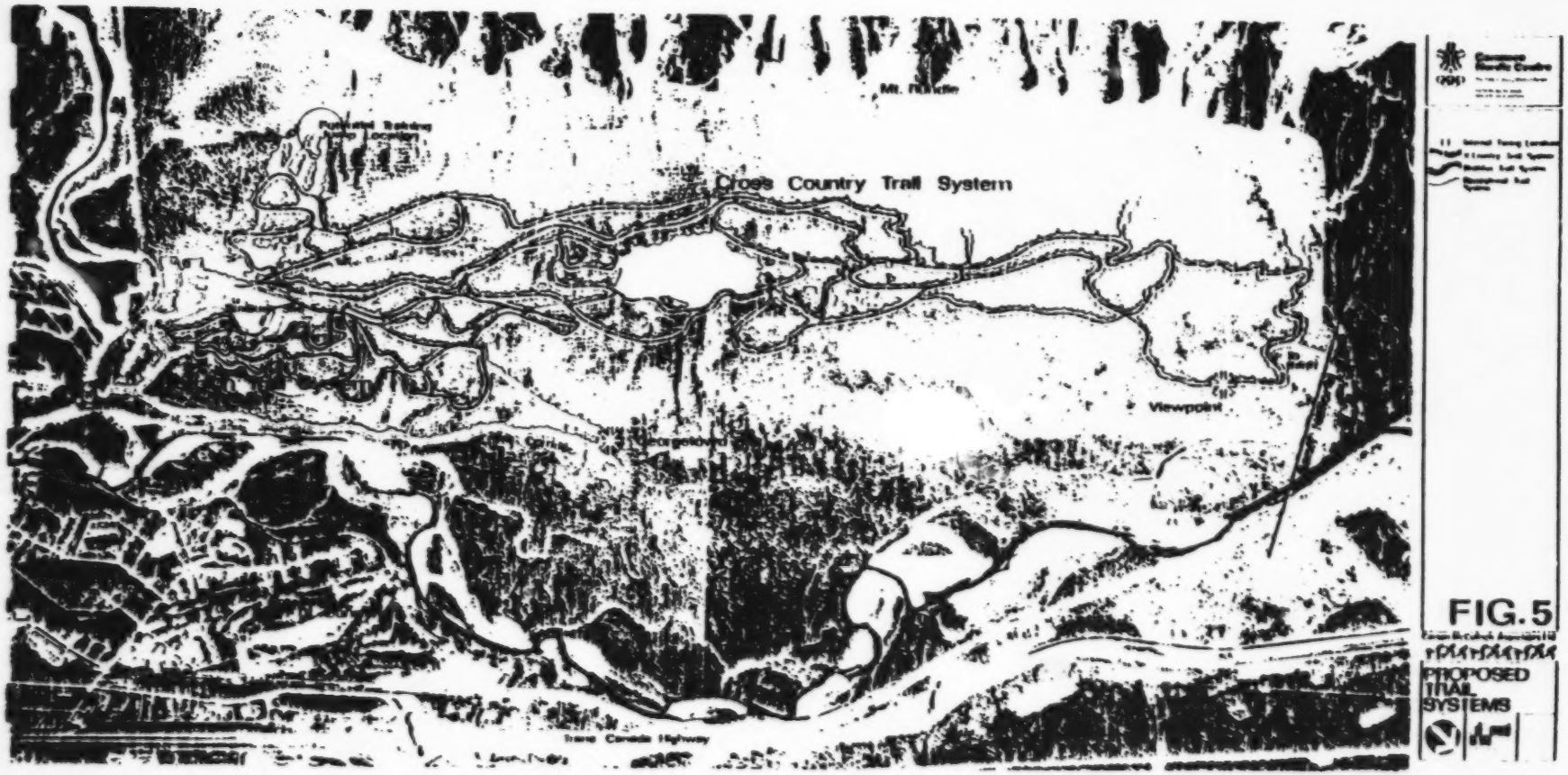

Cross Country Trail System
Viewpoint
PROPOSED
TRAIL
SYSTEMS

FIG. 5

stage and during construction. The corridors all have access to a wide variety of suitable terrain and this is a critical factor in accepting these alignments as being able to meet Olympic standards and expectations.

With proper layout, a limited number of well-designed, shorter loops can accommodate all events, as opposed to, for example, a 50 km loop. This approach is viewed to be somewhat advantageous from a spectator and media standpoint, as athletes pass through the main stadium area on a more frequent basis.

Preliminary inspections of the proposed competition trails systems have been undertaken by OCO'88 and representatives of the international sport governing bodies. The identified corridors have been supported in terms of their potential to provide high calibre competition trails.

Cross Country Trails:

In total, nine separate cross country courses have been conceptually designed which combined require approximately 32 km of trail corridor. These trails are located between elevation 1425 and 1550 metres on the upper portion of the site. They are designed to accommodate the men's 50 km, 30 km, 15 km, and 4 x 10 km events; the ladies' 20 km, 10 km, 5 km, and 4 x 5 km competitions; and for combined 15 km and 3 x 10 km events.

Biathlon Trails:

The Biathlon courses which have been designed for the Canmore Nordic Centre occupy approximately 20 km of trail corridor located north and west of the shooting range between elevation 1375 and 1465 m. While the minimum trail requirements for hosting biathlon events during the 1988 Winter Olympics total only about 17.5 km, it is felt that in the interest of long-term usability of the facility, greater flexibility should be provided. Additional trail loops have therefore been planned.

A number of considerations have directed the layout for biathlon courses. First, unlike cross-country events which test only an athlete's skiing ability, biathlon is a combined sport based upon both nordic skiing and marksmanship. This has implications in terms of the difficulty of trails, as athletes must carry the additional weight of a rifle, and also the maximum distance the trails can be located from the shooting range.

Secondly, as biathlon is a rapidly growing sport, trails have been designed to accommodate both women's and junior competitions, not currently part of the Olympic Games.

During the 1988 Winter Games, the three events which will be run include the Men's 20 km, 10 km and 4 x 7.5 km relay. If the site is to host a World Cup or a World Championship Biathlon competition however, it must as well accommodate a junior 15 km, 10 km and 7.5 km relay and a women's 10 km, 5 km and 5 km relay.

A variety of trails have been provided to ensure that races can be organized both to challenge world class competitors and also to provide lower level competition and training experiences to less accomplished athletes.

Individual biathlon trail loops are designed to be used in a variety of combinations at the discretion of race organizers. Collectively they meet all U.I.M.P.B. standards for hosting major events, and provide a range of options for laying out lower level races. Proposed biathlon trails include two - 5 kilometre, two - 3.75 kilometre, one - 2.5 kilometre, and one - 1.25 kilometre loops.

As well as these competitive trail loops, a gently rolling 1.5 km lighted roller ski trail is proposed through the terrain below the range area. In combination with the paved pedestrian walkway between the range and the main parking lot this track will provide a 2.5 km training loop for summer biathlon training programs.

Recreational Trails:

The recreational trail concept developed for the Canmore Nordic Centre is based upon satisfying three primary objectives:

- providing year round trail connectors from central facilities at the Nordic Centre to the Town of Canmore and also existing trail systems in Banff National Park;

- ensuring the highest quality hiking and skiing experience to recreational skiers wishing to enjoy the spectacular views offered throughout the site, or to view world class competitions from points within the competitive trail networks;

- providing opportunities for natural and cultural interpretation to occur at specific locations on the site.

The recreational trail corridors proposed at the Nordic Centre are based upon use of sections of the competitive trail systems as well as specially constructed recreational trails. In addition to existing roadways and competitive trails serving this dual function, approximately 10 km of recreational trail is proposed.

This trail runs horizontally through the site between the Smith Dorrien/Spray Trail and the Banff Park boundary and also includes a separate loop which swings north through the original site of Georgetown. From here it follows the top of the escarpment east to tie into the Town of Canmore pedestrian network.

3. Stadium Operations:

General:

A number of different operational scenarios have had to be considered in laying out the stadium area:

- the ability of the site to host a major event, specifically the 1988 Winter Olympics;

- the usability of the site for lower level competitions in either sport where limited numbers of officials would be available;

- the potential of the site as a training centre for all levels of athletes and teams;

- the convenience and attractiveness of the site to a growing number of recreational skiers who will wish to use the facilities concurrent with competition and training functions.

In order to maximize long term operational efficiency and meet the needs of competition, training and recreational users, particularly during peak times (e.g. weekends), the site has been organized to allow totally separate start/finish areas, trail systems, and to some degree support facilities for biathlon and cross country athletes.

An extensive evaluation of different competition and training scenarios has been undertaken to understand the circulation patterns of each associated activity and how potential conflicts can be avoided through site design. In addition, design required that recreational users be accommodated, without conflict under virtually all conditions.

Not only is the site designed to minimize conflict between athletes and officials if athletic events are occurring concurrently, but it also is extremely efficient in terms of spectators, suppliers, V.I.P.'s, and general recreationists.

A basic operational plan has been prepared as a part of the master plan which also addresses key operational personnel required to operate and maintain the site (exclusive of major competition and training needs), equipment requirements, and base operational cost estimates per annum.

Operational Flexibility and Options:

OCO'88, the agency responsible for staging the Olympic Winter Games, has proposed that the biathlon and cross country competitions utilize a common start/finish area for the Olympics. One of the primary reasons for proposing this approach is to minimize the duplication of facilities and activities required to host the Olympics (e.g. television broadcast booths, scoreboards, etc.).

In terms of accommodating OCO'88's operational requirements, the Steering Committee reviewed optional common start/finish lines which could be utilized for Olympic purposes. Although the site was not designed to ideally function with a common

start/finish area, the Committee attempted to identify the location which would be most acceptable from an operational and user standpoint. Figure 6 illustrates the selected common start/finish line; other options are also available. OCO'88 will identify temporary facility locations and programs required to support this operational scenario.

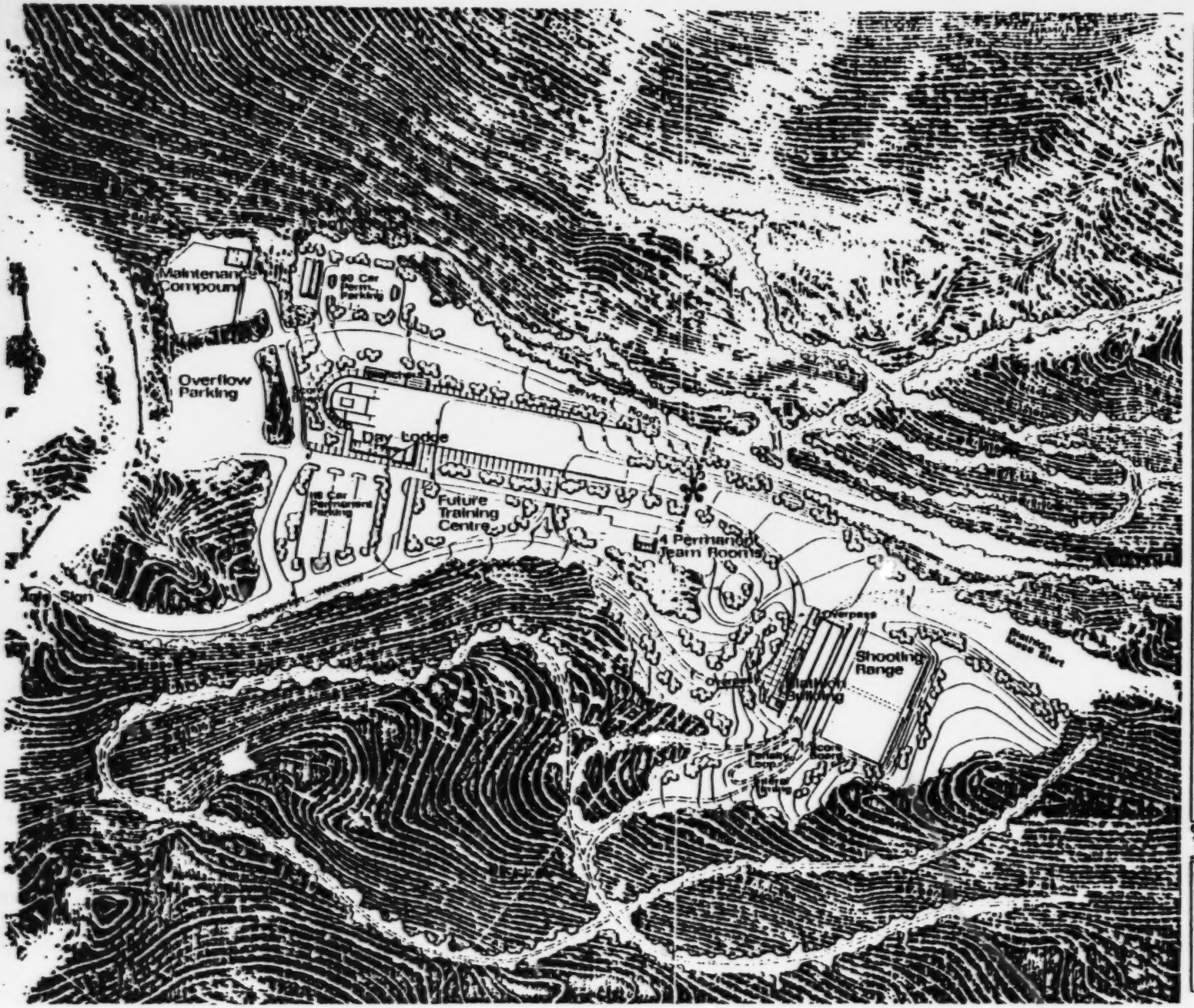
Minor adjustments to the site program and operations defined in the master plan will be required if a common start/finish line is utilized. For example, the trail systems would require some modification to ensure proper trail length, etc. In addition, certain functions which could have been accommodated in the permanent facilities may shift to temporary structures. All of the required adjustments are possible within the context of the master plan.

4. Environmental Protection Plan:

Environmental Mitigation:

Investigation of the site and a review of relevant literature have revealed no areas of extreme environmental sensitivity, either in terms of unique plant communities or critical wildlife habitat.

Environmental resources which have been identified include typical subalpine forest, predominantly spruce and pine which cover 95% of the site; sport fish, mainly trout and whitefish in the Bow River; and wildlife, mainly elk and whitetailed deer which are found in the flood plain and more westerly portions of the site.



Canmore Nordic Centre

PROPOSED OLYMPIC COMMON START / FINISH AREA

FIG. 6

Carson McCulloch Associates Ltd.

PERMANENT STADIUM FACILITIES

Potential problems which should be anticipated include:

a) Siltation of the Bow River associated with large areas of clearing and grading.

b) Loss of wildlife habitat due to removal of forest in high use areas.

c) Disturbance and harrassment of wildlife by construction activities and visitors to the site.

d) Possible windthrow associated with extensive clearing in a closed canopy forest.

e) The alteration of existing drainage patterns and consequent damage of downslope vegetation.

Mitigation measures:

Stadium site selection and trail planning for the nordic centre have in part been based upon avoiding the more environmentally sensitive areas of the site, and in themselves represent the most significant mitigation measures.

Stadium facilities have been concentrated adjacent to the Smith-Dorrien/Spray Trail and trails have been kept out of the Bow Valley Flood Plain, well away from areas heavily used by wildlife.

In addition, a number of measures are recommended for reducing impact during the construction and post-construction periods.

Construction Phase:

a) A pre-construction survey of trail corridors should be conducted to identify site specific problems associated with erosion, drainage, windthrow or damage or rare plants. This information can be used in the realignment of specific trails and/or the design of appropriate structural erosion or drainage controls.

b) Timing of major construction activities should be restricted to times which do not conflict with critical periods for fish and wildlife. Activities which are potentially disruptive to wildlife should occur after the third week in June, to avoid calving and fawning. Activities which cause serious siltation should occur from July 15 to September 10.

c) An environmental coordinator should be appointed with the responsibility of monitoring construction activities and briefing contractors regarding potential impacts on fish and wildlife and how to minimize them.

d) Trail construction and reclamation should be carried out in small portions of the site at one time. This will minimize widespread erosion problems and disturbance to wildlife.

e) Helicopter traffic in the area should be restricted as much as possible to the summer period, be directed along a single flight line, and maintain a minimum altitude of 400 metres over the site to reduce disturbance to wildlife.

f) Where blasting is required, a silent demolition compound should be utilized. This would be a liquid substance which solidifies in rock and shatters within 7 to 9 hours. It provides greater precision and avoids disruption of wildlife. Many small blasts rather than larger blasts should be used.

Operating Phase:

a) All non-essential motorized vehicles should be restricted from the site to avoid damage to trail surfaces and disturbance of wildlife.

b) Recreational users should be educated to avoid harassing wildlife by off trail skiing and to keep all dogs leashed.

c) No camping should be permitted on site.

d) Kananaskis Country regulations regarding garbage storage and handling should be instituted to avoid attraction of bears.

e) An ongoing environmental monitoring program should be established to ensure that the above recommendations are carried out.

PART IV IMPLEMENTATION

A primary objective of the master planning process has been to ensure that sufficient facilities are available for pre-Olympic competition in 1986-87. Gradually increasing levels of competition prior to 1988 are considered vital both from the standpoint of testing and fine tuning facilities, and also training operators and course officials. This objective forms the basis of implementation planning for the Canmore Nordic Centre.

One of the most critical aspects of meeting this deadline concerns coordination of detailed design and construction activities. The Nordic Centre as proposed is made up of two basic components, trail systems and base facilities. While these are complementary facilities and must be developed concurrently, the nature of the design and construction procedures involved are significantly different.

1. Trail Development:

The development of a high quality competitive nordic ski trail is as much an art as it is a science, and as such should be viewed as an evolutionary process. This is especially true on sites like Georgetown where a limited amount of terrain is available and the optimal use of what is available is essential.

In the master plan, available terrain has been analyzed and the best possible combination of cross country and biathlon courses have been planned to complement the selected stadium layout. At this level, however, they still remain as "conceptual trail corridors" with the detailed design remaining to be done.

To ensure the highest standard of trail development, the remaining design and construction process must be closely interrelated and will require three separate stages of activity for any given section of trail. These three stages allow for detailed flagging, measurement and adjustment, inspection and approval, ski testing and fine tuning prior to the 1988 Olympics.

The three stages of trail design and construction include:

Stage I: detailed flagging and slashing of a one to two metre wide centre line to allow for more accurate measurements;

Stage II: widening the intially slashed centre line to approximately 3 to 4 metres and grading to allow ski testing, detailed measurement and final approval by technical delegates;

Stage III: final clearing of trails to required widths, grading, installation of drainage structures, crossing and landscape reclamation.

The trail development strategy illustrated on the following schedule (Fig. No. 7) divides design and construction into five separate components. This approach permits the three stage evolution of trails as described, and as well will ensure that trails are approved and in place for a major competition to be held in 1986-87.

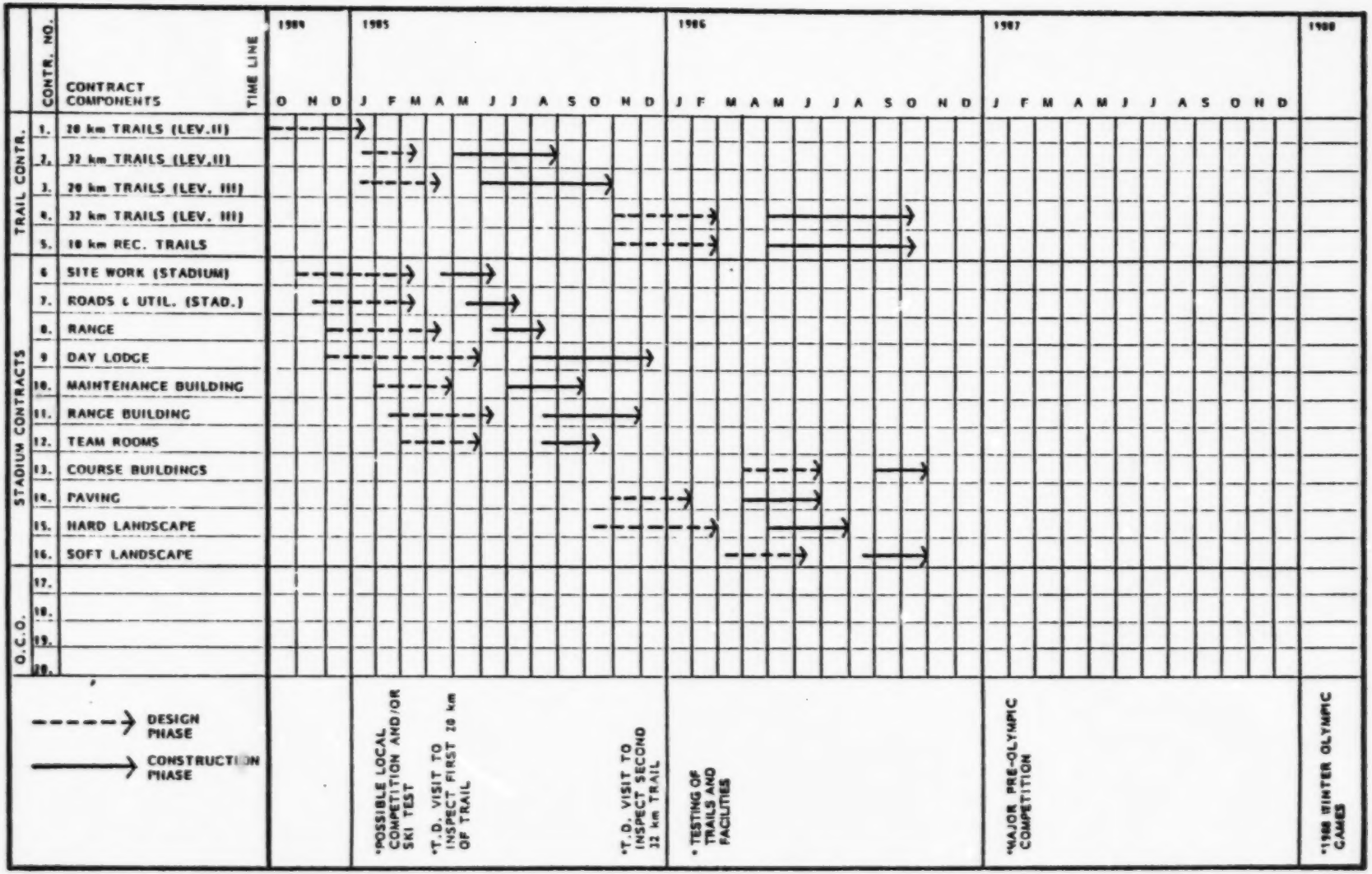

CONTR. NO.
CONTRACT COMPONENTS
TIME LINE
1984
1985
1986
1987
1988
O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J
TRAIL CONTR.
1. 20 km TRAILS (LEV.II)
2. 32 km TRAILS (LEV.II)
3. 20 km TRAILS (LEV. III)
4. 32 km TRAILS (LEV. III)
5. 10 km REC. TRAILS
STADIUM CONTRACTS
6 SITE WORK (STADIUM)
7. ROADS & UTIL. (STAD.)
8. RANGE
9 DAY LODGE
10. MAINTENANCE BUILDING
11. RANGE BUILDING
12. TEAM ROOMS
13. COURSE BUILDINGS
14. PAVING
15. HARD LANDSCAPE
16. SOFT LANDSCAPE
O.C.O.
17.
18.
19.
20.
DESIGN PHASE
CONSTRUCTION PHASE
*POSSIBLE LOCAL COMPETITION AND/OR SKI TEST
*T.D. VISIT TO INSPECT FIRST 20 km OF TRAIL
*T.D. VISIT TO INSPECT SECOND 32 km TRAIL
* TESTING OF TRAILS AND FACILITIES
*MAJOR PRE-OLYMPIC COMPETITION
*1988 WINTER OLYMPIC GAMES

Figure 7 Implementation Schedule

2. Stadium Development:

Development of stadium facilities and infrastructure to the Canmore Nordic Centre has been separated into 11 components as described on Fig. No. 7. These components only relate to permanent services and facilities proposed for the nordic centre.

As with trail construction, the objective in scheduling base facility development is to have sufficient facilities in place to allow hosting of a major competition in 1986-87.

Temporary Facilities (OCO'88):

Installation of the bulk of festival specific facilities for hosting the 1988 Olympic Games is anticipated for the summer of 1987, but could proceed concurrent to other construction as early as the summer of 1986 when the basic infrastructure is in place. Specific requirements and schedules for hosting pre-Olympic and Olympic competitions will be provided by OCO'88 and will be integrated into the capital development construction schedule, as required.

PART V COSTS

Preliminary cost estimates have been prepared on the basis of the development program outlined in the master plan. The cost of developing the Canmore Nordic Centre site is estimated at approximately $12,900,000. In addition to this, the cost of upgrading the 1.8 kilometre primary access road to the site is estimated at $2,500,000, for a total project cost of $15,400,000. Cost estimates will be further refined in the detailed design stages of project implementation.

Basic annual operating costs have also been assessed and are estimated at $200,000 per annum.

Costs have been expressed in 1984-85 dollars.